

HEAT INJURY PREVENTION

MANSCEN SAFETY OFFICE

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Agenda

- Introduction: Why heat prevention is important.
- How your body regulates core temperature.
- Factors that influences the body's heat.
- Heat Illness: Predisposing Factors.
- Pathophysiology of Heat Illness
- Preventing Heat Illness.
- Fluid Replacement & Military Doctrine
- Nutrition in a Hot Environment

Why Heat Prevention?

- Combat capability is contingent upon the ability to adapt to the environment.
- The body can survive only at a narrow range of core temperatures.
- Core temperatures that vary more than 2 or 3 degrees from the normal 98.6 impede mental and physical performance and variations more than 5 or 6 degrees can be fatal.

How your Body Regulates Core Temperature

- Vasodilation
- Vasoconstriction
- Sweating Shivering
- Increasing/Decreasing Activity
- Behavioral Responses



Factors that influences the body's temperature regulation

- Air temperature.
- Temperature of surrounding objects.
- Sun's radiant heat.
- Relative humidity.
- Air movement.
- Amount and type of clothing worn.
- Heat produced by the body from physical activity.

MISSION

- work rate
- uniform
- load
- terrain

SOLDIER

- fitness
- hydration
- rest
- nutrition
- acclimatization
- medication
- illness

ENVIRONMENT

- temperature
- humidity
- solar load
- wind speed

Heat Illness

- **Predisposing Factors**

- Individuals who are not acclimatized.
- Physical activity
- Extremes of age, poor physical condition, fatigue
- Excessive clothing/Tight clothing
- Dehydration
- Cardiovascular disease
- Skin disorders
- Obesity
- Drugs and alcohol
- State of health

[fever, recent immunizations, etc.]



Drugs that Interfere with Thermoregulation

- Increase heat production

- Thyroid hormone
- Amphetamines
- TCAs
- LSD (lysergic acid diethylamide)

- Decrease thirst

- Haldol

- Decrease Sweating

- Antihistamines
- Anticholinergics
- Phenothiazines
- Benztropine



Pathophysiology of heat

- Heat Rash
- Heat Cramps
- Heat Syncope
- Heat Exhaustion
- Heat Stroke (Hyperthermia) **MEDICAL EMERGENCY**
- Hyponatremia: **MEDICAL EMERGENCY**



Heat Rash

(Prickly Heat)

Symptoms

- A skin rash most commonly found on clothed areas of the body.
- Heat Rash can impair body heat loss and degrade performance for many days after it's disappearance.

Management

- Cleanse the affected area thoroughly and dry completely.
- Calamine or other soothing lotion may help relieve the discomfort.

Heat Cramps

Symptoms

- Severe pain and cramps in legs and abdomen
- Faintness or dizziness
- Weakness
- Profuse sweating

Management

- Increase salt intake by giving salty fluids.
- Increase fluid.
- Encourage reduction in activities.
- Move victim to a cool location.
- Stretch the muscle.

Heat Syncopy (fainting)

Symptoms

- Faintness
- Dizziness
- Headache
- Increased pulse rate
- Restlessness
- Nausea and vomiting
- Possibly even a brief loss of consciousness.

Management

- The person should lie or sit down, preferably in the shade or in a cool environment.
- Elevate the feet.
- Give fluids, particularly those containing salt

Heat Exhaustion

Symptoms

- Sweating
- Skin - Pale, clammy
- Pulse - Increased
- Respiration's - Increased
- Temperature - normal or slightly elevated
- Urine Output - Decreased
- Patient feels weak, dizzy, thirsty, "sick," anxious
- Nausea and vomiting

Management

- Move to a cool environment
- Loosen clothing
- Apply ice packs
- Elevate legs above the heart
- Furnish with liquids

Heat Stroke - Hyperthermia **MEDICAL EMERGENCY!**

Symptoms

- Skin - HOT, gets pale, may be wet or dry, and flushed.
 - Pulse Rate - increased
 - Respiratory Rate - increased
 - Urine Output - decreased
 - Temperature - increased)
 - Changes in mental status and motor/sensory changes, may become comatose, seizures.
 - Pupils - may be dilated and unresponsive to light
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- Early Signs:
 - Headache, dizziness, delirium, weakness, nausea, vomiting and excessive warmth.
 - Sweating may or may not be present.
 - Skin has a reddish tinge to it and is dry.
 - Rapid pulse

Management

- **MEDICAL EMERGENCY!**
- Reduce body temp. as fast as possible- ice, bath, etc.
- Move to shady area and loosen clothing.
- Slowly give large amounts of water [only if conscious].
- Elevate legs.
- Basic life support, CPR if needed.
- **ASAP SEEK MEDICAL HELP!!!**

Fluid Depleted vs. Fluid Intact

- **Fluid depleted** -

The person has Heat Exhaustion due to fluid loss from sweating and/or inadequate fluid replacement, but continues to function in a heat challenge situation.

- **Fluid intact (fast**

onset) The person is under an extreme heat challenge. The heat challenge overwhelms the body's active heat loss mechanisms even though the fluid level is sufficient.

Hyponatremia:

EMERGENCY!

Symptoms

- Nausea
- Muscle cramps
- Disorientation
- Slurred speech
- Confusion, and inappropriate behavior
- Seizures or coma, and death can occur.

Management

- Severe symptoms require treatment by qualified medical personnel.
- Minor symptoms, can be treated by eating salty foods and hydrating with a sodium containing sports drink.

Preventing Heat Illness

- Education and Awareness
- Doctrine
 - Sensible Guidance Regarding Fluid Replacement
 - Conservative Evacuation Criteria
- Acclimatization/Physical Fitness
- Hydration
- Work/Rest Cycles
- Reduce Exposure to Heat
- Clothing, Equipment and Supplies



Wet-bulb Globe Temperature (WBGT) Index

- Accounts for humidity and radiant heat.
- Most accurate measure of environment heat stress and risk of heat illness.
- Take the temperature measurements in a location which is the same as your environment.
- Add 10 degrees F to the WBGT indication when wearing body armor or in MOPP
- Adjust the workload accordingly.



Stages of Prevention

Primary Prevention

- **Identify** soldiers and units at risk
- **Measure** environmental heat stress
- **Analyze** the mission or training for heat injury risk
- **Institute** measures to reduce risk

Secondary Prevention

- **Recognize** heat strain early
- **Provide** water, rest, shade and cooling
- **Treat** heat casualties at the earliest possible moment
- Remember the WEAK LINK RULE

Fluid Replacement & Military Doctrine

- Hydration is Essential for Health and Performance
- Water Is a Tactical Weapon
- Mandatory/Enforced Drinking Practices



Fluid Replacement Guidelines for Warm Weather Training (Average Acclimated Soldier Wearing BDU, Hot Weather)

Heat Category	WBGT Index, °F	Easy Work		Moderate Work		Hard Work	
		Work /Rest	Water Intake, Qt/h	Work /Rest	Water Intake, Qt/h	Work /Rest	Water Intake, Qt/h
1	78-81.9	NL	½	NL	¾	40/20 min	¾
2	82-84.9	NL	½	50/10 min	¾	30/30 min	1
3	85-87.9	NL	¾	40/20 min	¾	30/30 min	1
4	88-89.9	NL	¾	30/30 min	¾	20/40 min	1
5	> 90	50/10 min	1	20/40 min	1	10/50 min	1

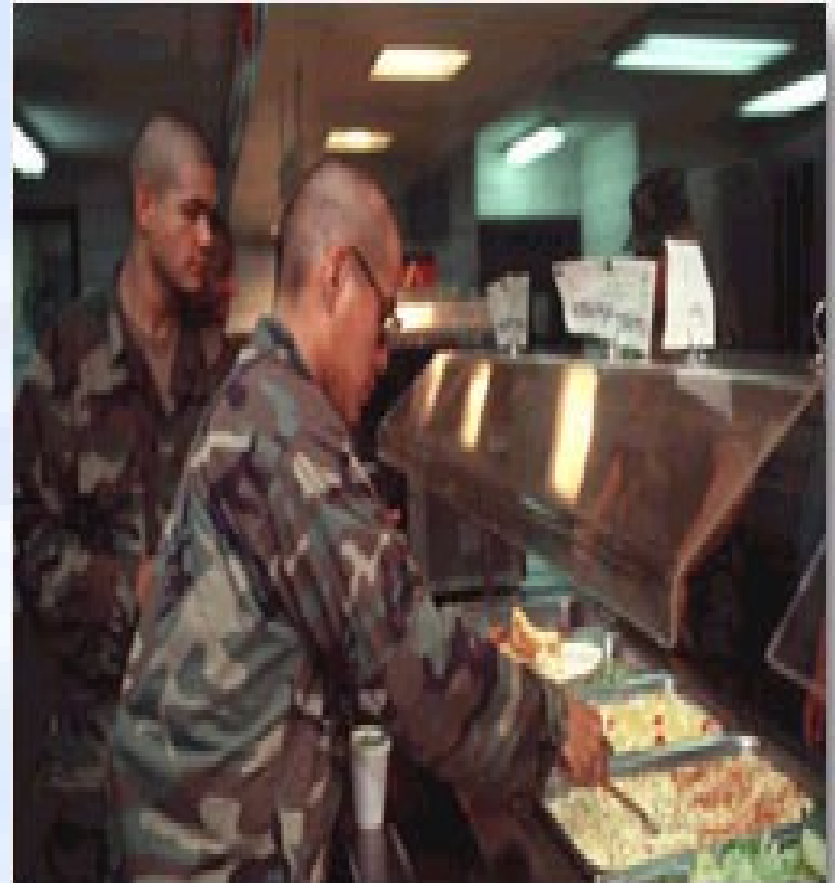
Maintain Adequate Hydration

- Adjust fluid intake and work-rest cycles as temperature varies.
- Enforce routine water consumption.
- Provide palatable water
- Monitor soldiers for signs of dehydration.
- Maintain Adequate Food Intake

Nutrition in a Hot Environment

(Points to Remember)

- In hot weather, the amount of calories required actually increases slightly although the desire to eat goes down.
- Eating a variety of ration component/foodstuffs will help ensure sufficient vitamin intake.



Nutrition (Cont.)

- Thirst alone is not a good indicator of adequate fluid intake so soldiers will always need to drink before they feel thirsty.
- Plain water is the beverage of choice. Glucose-electrolyte beverages may be useful under unusual conditions such as energy expenditure with restricted food intake.

Nutrition (Cont.)

- The amount of salt lost in sweat varies depending on a person's degree of acclimatization. As the body adjusts, or acclimatizes to the heat, sweat contains less salt.
- Excessive salt intake without adequate water intake will lead to dehydration.

References

- TB MED 507, Occupational and Environmental Health: Prevention, Treatment, and Control of Heat Injury, July 1980.
- TB MED 81, Cold Injury
- FM 21-10, Field Hygiene and Sanitation
- GTA 5-8-12, 25 Feb 99 [Individual Safety Card]
- U.S. Army Research Institute of Environmental Medicine